| Name: |
|---|
| Enrolment No: |



## UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
### End Semester Examination, December 2022

**Course:** B Tech  **Semester: V**
**Program:** FSE  **Time : 03 hrs.**
**Course Code: HSFS 3026 (**Chemical Engineering II (Unit Operations)  **Max. Marks: 100**

- **Instructions:**
- ✓ This question paper contains three sections. Answer all sections.
- ✓ No codes and additional support material is allowed for reference.
- ✓ Any data missing, may be suitably assumed and stated.
- ✓ Draw figures, wherever necessary to support your answer.

### SECTION A
### (5Qx4M=20Marks)

| S. No. | | Marks | CO |
|---|---|---|---|
| Q 1 | i. Convert a pressure of 1.5 atm into kPa.<br>ii. Convert a volumetric flow rate of 10,000 l/s to m3/s. | 2+2=4 | **CO1** |
| Q 2 | Explain unit operations and their role in any chemical process industry? | **4** | **CO1** |
| Q 3 | What are the hazardous chemicals used and stored in "Central Instrumentation Center Lab, UPES" as per NFPA. | **4** | **CO1** |
| Q 4 | A pressure gauge on a tank reads 48 psig on a day when the barometer reads a pressure of 30 inches of mercury. Find the absolute pressure in the tank in psi. | **4** | **CO1** |
| Q 5 | List out the types of size-reduction machines. Briefly explain any one type. | 2+2=4 | **CO1** |

### SECTION B
### (4Qx10M= 40 Marks)
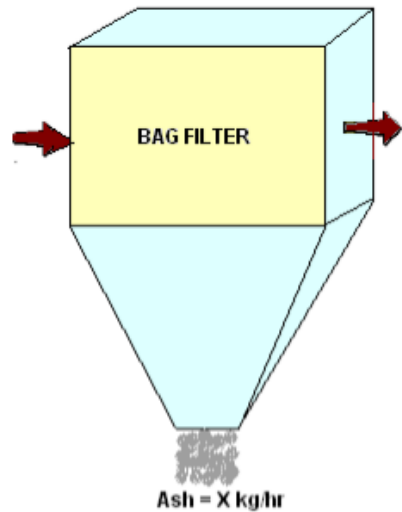
| Q 6 | | 10 | **CO2** |
|---|---|---|---|
| Q 7 | A fabric bag filter is used to remove the ash from the inlet gas stream so that outlet gas stream meets the required emission standards in a chemical industry. During an air pollution monitoring study, the inlet gas stream to a fabric bag filter is 2200 cubic meters per minute and the ash loading is 5000 milligram per cubic meter. The outlet gas stream from fabric bag filter is 50 cubic meters per second and the ash loading is 60 milligram per cubic meter. What is the | 10 | **CO3** |

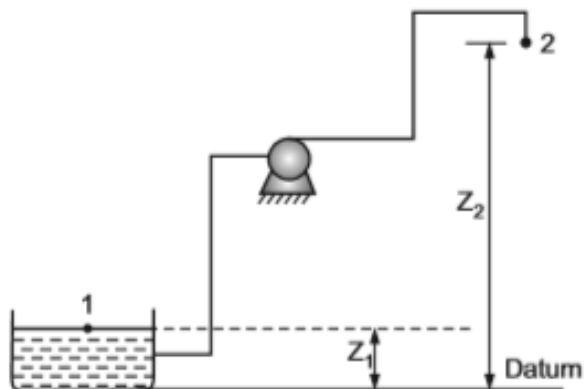| | | | |
|---|---|---|---|
| | maximum quantity of ash that will have to be removed per hour from the fabric bag filter?  Ash = X kg/hr | | |
| Q 8 | Skim milk is prepared by the removal of some of the fat from whole milk. This skim milk is found to contain 90.0 % water, 4.3 % protein, 4.8 % carbohydrate, 0.1 % fat and 0.8 % ash. If the original milk contained 4.8 % fat, calculate its composition assuming that fat only was removed to make the skim milk and that there are no losses in processing. ? | 5+5=10 | CO3 |
| Q 9 |  Pl refer the following figure and explain: a) The principle behind lifting the fluid from point 1 to point 2. b) The Bernoulli's equation between points 1 and 2. | 5+5=10 | CO2 |

| | **SECTION-C**<br>**(2Qx20M=40 Marks)** | | |
|---|---|---|---|
| Q 10 | Dairy Industries now a days plays a significant role in the Indian economy. Milk is an essential Commodity which is to be consumed by all aged people. The production processes cover Fresh Liquid Milk, Fermented Milk, Butter, Chanch, Paneer, Skim Milk Powder, Ghee, Icecream. Milk was collected from farmers of different locations & transported through tankers for its processing at factory through different process like filtration, pasteurization, homogenization, heat treatment, refrigeration etc. During the operational activity at different sections, various hazards exists which may harm to employees & surrounding if adequate measures not ensure.<br><br>Please explain associated hazards and control measures required to avoid any untoward incident in dairy industry. | 10+10=20 | CO4 |
| Q 11 | <br>PNEUMATICS TRAINER KIT<br><br>Pl refer above picture, where you are performing hands on training in "Hydraulic and Pneumatic Trainer Lab". Based on your learnings answer the following questions –<br><br>i.    How the compressed air is used to do mechanical work to produce motion & to generate forces.<br>ii.    Define pump and state the purpose of the pump in hydraulic system.<br>iii.    How are the control valve classified? | 4+4+4+4+4=20 | CO3 |

| | | iv. Mention any four applications of pneumatics in engineering field.<br>v. Explain types of directional control valve along with their actuation symbols. | | |
|---|---|---|---|---|